OCCUPATIONAL SAFETY
AND HEALTH STANDARDS BOARD
2520 Venture Oaks Way, Suite 350
Sacramento, CA 95833
(916) 274-5721
FAX (916) 274-5743
www.dir.ca.gov/oshsb

Attachment No. 2

INITIAL STATEMENT OF REASONS

CALIFORNIA CODE OF REGULATIONS

TITLE 8: Division 1, Chapter 4, Subchapter 4, Article 2, Section 1504; Article 10, Section 1591, New Appendix A; and Article 11, Section 1597 of the Construction Safety Orders; and Subchapter 7, Article 25, Section 3363; and Article 93, New Section 4925.1 of the General Industry Safety Orders; and Subchapter 17, Article 17, Section 7016 of the Mine Safety Orders

Vehicle Exhaust Retrofits

SUMMARY

This rulemaking was initiated in response to Occupational Safety and Health Standards Board (Standards Board), Petition 507, submitted on August 7, 2008 by Associated General Contractors of California and Operating Engineers, Local 3, concerning modifications of the exhaust systems (exhaust retrofits) of off-road vehicles to comply with the California Air Resources Board (ARB) in-use off road diesel regulation which was approved by the ARB in 2007. According to the ARB, the off-road diesel regulation is necessary to meet U.S. Environmental Protection Agency (EPA) air quality standards for fine particulate pollution (PM2.5) and reduce the number of annual PM2.5-related premature deaths in California, which the ARB estimates is 9,200.[1] The regulation calls for the installation of exhaust retrofits on diesel-powered construction equipment, mining equipment, and industrial equipment used throughout the state. The regulation has provisions that would exempt vehicles from retrofit if that retrofit could not be done safely, and the regulation defers to the regulations of the Standards Board in making that determination. The ARB estimated that approximately 150,000 vehicles are subject to the retrofit requirements adopted in 2007; however, in October, 2010, the ARB noticed proposed amendments to the regulation which will be heard at the December, 2010, ARB meeting. The amendments would allow employers to turnover vehicles in lieu of installing retrofits. To comply with the proposed amendments, it is anticipated that employers will elect to retrofit a vehicle only where that is the most cost effective method of compliance. If the amendments are adopted, the total number of retrofits would be much smaller than the number required by the regulation adopted in 2007.

[1] Estimate of Premature Deaths Associated with Fine Particle Pollution (PM2.5) in California Using a U.S. Environmental Protection Agency Methodology, California Air Resources Board, August 31, 2010.

The Petitioners asserted that some recent installations of diesel particulate filters on construction vehicles to comply with the new ARB off-road diesel regulation create safety hazards. The Petitioners requested that the Construction Safety Orders be amended to:

1. Require that equipment and accessories installed on haulage vehicles be so arranged as to avoid impairing the driver's operational vision (the current standard requires that such installations avoid impairing the driver's operational vision to the front or sides, but does not address vision to the rear).

2. Require that any modifications and structural changes that affect the capacity, safety, structural integrity, operator's visibility, or handling of haulage vehicles be approved by the vehicle manufacturer.

3. Prohibit modifications of exhaust systems that would create a fire hazard, or expose employees to burns from radiant heat and/or high temperature surfaces.

The ARB opposed the Petitioners suggested language regarding operator visibility on the basis that it lacked objective criteria for determining compliance and that it was not reasonable to expect that vehicle manufacturers would approve exhaust modifications performed by other parties. The ARB asserted that the Petitioner's language would undo its off-road vehicle diesel exhaust retrofit program.

The Standards Board granted Petition 507 on November 20, 2008, and directed staff to work with the Petitioners, ARB, and other affected parties, as appropriate, to develop a rulemaking proposal to be presented to the Board at a future public hearing.

Standards Board staff, ARB staff, and the Petitioners met with staff of the Governor's Office to discuss how to move forward with the Board's Petition Decision and maintain the health benefits of the diesel particulate regulation. In response to the directions given by the Governor's Office, ARB, Standards Board staff, and Division staff worked cooperatively to complete two products. The first product was an interim policy, which currently is in place and recognized by the Air Resources Board, to the effect that no retrofit should be installed on off-road equipment if it impairs visibility to the front, rear, or sides. The second product was a joint field study to examine the impact that exhaust retrofits would have if installed on fifty of the most common types of vehicles in the ARB inventory of vehicles that are subject to the ARB off-road diesel regulation and that are potential candidates for exhaust retrofits. [2]

[2] Preliminary Results of Joint ARB/DOSH/OSHSB Field Study of Retrofit Feasibility for Most Common Vehicles, California Air Resources Board Staff Report, May 10, 2010.

SPECIFIC PURPOSE AND FACTUAL BASIS OF PROPOSED ACTION

Section 1504. Definitions.

Section 1504 provides definitions that apply in the application of the Construction Safety Orders (CSO). The proposal would add a new definition of "exhaust retrofit." This definition is needed because the term "exhaust retrofit" is not defined elsewhere, and the term is used extensively in this proposal. This new definition is necessary to provide clarity as to the application of the proposed amendments.

Section 1591. Haulage Vehicles, Equipment-Construction and Maintenance.

Section 1591 pertains to the construction and maintenance of haulage vehicles and haulage vehicle equipment**.**

New Subsection (m).

The proposal would add a new subsection (m) pertaining to the installation and maintenance of exhaust retrofits on haulage vehicles. New subsections (m)(1) through (m)(4) would address potential hazards of exhaust retrofits, including fires and burns, operator's safe assess and egress, and impact on the vehicle's structural and operational safety. Subsection (m)(5) would require that employers test vehicles equipped with exhaust retrofits for operator's visibility and that retrofit vehicles pass the visibility test in Appendix A of Section 1591. Subsection (m)(6) would require employers to maintain a record of the required visibility testing. The proposed provisions of subsection (m) are necessary to protect workers from exposure to hazards created by unsafe exhaust retrofits.

New Subsection (m)(1).

New subsection (m)(1) would prohibit exhaust retrofits that reduce the capacity, structural integrity, or safe performance of a vehicle. The proposed provision is necessary to prevent exhaust retrofit installations that reduce the stability of the vehicle, the strength of vehicle structures, or the ability of the vehicle to perform safely. For example, the proposed provision is necessary to prevent the installation of retrofit pollution control devices, which can weigh more than 150 pounds, on rollover protective structures (ROPS), including protective frames and enclosures, where the installation reduces the vehicle's stability, strength of the ROPS, or ability of the ROPS to perform as designed.

New Subsection (m)(2).

New subsection (m)(2) would prohibit exhaust retrofits that reduce the operator's ability to access or egress a vehicle safely. The proposed provision is necessary to prevent the installation of an exhaust retrofit in a location or manner that obstructs the operator's safe access to, or egress from, the operator seat or station. For example, the provision is necessary to prevent retrofit exhaust installations that interfere with the use of steps or handles designed for the

operator's safe access or egress, or that interfere with the use of an emergency exit from the vehicle cab or operator enclosure.

New Subsection (m)(3).

New subsection (m)(3) would provide that an exhaust retrofit shall be located or shielded such that it does not increase the risk of a fire due to contact with hydraulic fluid, or fuel, spilled during transfer or sprayed from a broken hose, pipe, or container. The proposed provision is necessary to prevent an accidental release of hydraulic fluid, or diesel fuel, from contacting a hot surface of an exhaust retrofit that is capable of volatilizing the combustible liquid and igniting the vapors. According to a National Institute for Occupational Safety and Health (NIOSH) report that analyzed mine fires occurring between 1990 and 2001, hydraulic fluid, or fuel, sprayed onto mobile equipment hot surfaces was responsible for 89 fires out of a total of 518 fires.[3] These 89 fires resulted in 46 injuries and 3 fatalities. At least 55 of the 89 mobile equipment hydraulic fluid/fuel fires became large fires. Of note is that the hydraulic fluid fires subsequently involved the fuel system. In at least 18 instances, the cab was suddenly engulfed in flames, forcing the operators to make an unsafe exit, probably due to the ignition of flammable vapors and mists that penetrated the cab. The provision is necessary to prevent an increase in these types of fires and injuries because the surface temperatures of exhaust retrofits can exceed the surface temperatures of Original Equipment Manufacturer (OEM) exhaust systems, and exhaust retrofits may be installed in locations where they are more likely than OEM exhaust systems to be contacted by a spill or release of hydraulic fluid or fuel.

New Subsection (m)(4).

New subsection (m)(4) would provide that an exhaust retrofit shall be located or effectively shielded such that it does not increase the risk of the operator, during performance of normal duties, contacting exhaust system surfaces having a temperature of 140 degrees F (60 degrees C) or higher. The proposal is necessary to prevent vehicle operators from second degree burns caused by contact with hot surfaces of exhaust retrofits while performing normal duties, such as getting on and off the vehicle. ASTM International guidelines suggest that the maximum temperature of a surface contacted by the skin for 5 seconds (the probable contact time for industrial situations) without resulting in second degree burns is approximately 140 degrees Fahrenheit.[4] The provision is necessary to prevent an increase in serious burn injuries caused by contact with vehicle exhaust systems because the surface temperatures of exhaust retrofits can exceed the surface temperatures of OEM exhaust systems, and exhaust retrofits may be installed in locations where they are more likely to be contacted by an operator performing normal job duties.

[3] De Rosa, M.I. (2004). Analysis of Mine Fires for All U.S. Metal/Nonmetal Mining Categories, 1990-2001. NIOSH IC 9476.
[4] Standard Guide for Heated System Surface Conditions that Produce Contact Burn Injuries, ASTM C 1055 – 03, ASTM International.

New Subsection (m)(5).

New subsection (m)(5) would provide that before a vehicle equipped with an exhaust retrofit is placed in use, the effect of the retrofit on the operator's visibility shall be evaluated in accordance with the Visibility Testing Procedures (visibility test) in Appendix A of Section 1591 and the retrofit shall pass the visibility test in accordance with Section B of Appendix A. The proposed test procedures and criteria are necessary to protect employees working near a retrofit vehicle from being struck by the vehicle due to the retrofit blocking the operator's view. According to the Division's review of accident report data in OSHA's Integrated Management Information System (IMIS), during an approximately 8-year period ending in 2007, there were 44 fatalities and 45 severe injuries to employees caused by contact with haulage vehicles, earthmoving equipment and similar vehicles on job sites.[5] A common contributing factor to these accidents is that the operator could not see the accident victim because part of the vehicle obstructed the operator's view. Existing Section 1591(b) provides that equipment and accessories installed on haulage vehicles shall be arranged so as to avoid impairing the driver's operational vision to the front or sides; however, it does not address the operator's vision to the rear. The proposed provision is necessary to address the operator's vision to the rear, in addition to the front and sides, because most accident victims are struck by vehicles that are backing up. The proposed provision is also necessary to provide an objective means of determining compliance with visibility requirements.

New Subsection (m)(6).

New subsection (m)(6) would require employers to maintain and have readily available a written record of the visibility testing conducted on each retrofit vehicle required to be tested in accordance with subsection (m)(5). The written record is necessary to document that visibility testing has been performed and that the retrofit vehicle passes the visibility test criteria in Appendix A as required by subsection (m)(5).

An exception to subsection (m)(6) is proposed which would exempt an employer from the requirement to maintain a record of the visibility testing conducted on a vehicle, provided that all sections of the exhaust retrofit are completely inside the Original Equipment Manufacturer (OEM) engine compartment. The exception is necessary to eliminate the burden of maintaining records where it is possible to simply observe that the retrofit complies with visibility requirements.

New Appendix A to Section 1591: Visibility Testing Procedures (Mandatory).

The visibility testing procedures in Appendix A would provide a method for determining the extent to which installation of an exhaust retrofit would block the operator's view of a person standing near a vehicle. Appendix A would define "masking" as the area where the operator's view is blocked. The proposed procedures are similar to a test method in an international standard, ISO 5006, used by vehicle designers and manufacturers to determine masking created

[5] DOSH Inspections with Crane Standards Cited: 1590, 1591, 1592, 1593, 3663, and 3706, Report generated by Bob Hayes, DOSH Budget and Program Offices, transmitted to OSHSB on November 19, 2008.

by vehicular equipment.[6] The proposed procedures were developed by Board staff, with assistance from ARB and Division staff, as part of a joint ARB/DOSH/OSHSB field study that examined masking created by retrofits on fifty common types of off-road vehicles.[2] The proposed visibility test procedures are substantively the same as test procedures used in the joint field study. The proposed visibility test procedures are necessary to provide a relatively simple, objective and reproducible field test to evaluate masking created by an exhaust retrofit.

The proposed criteria for passing the visibility test would prohibit retrofits that block the operator's view of the top of a 5 foot tall railing positioned around the vehicle directly above a line on the test surface located a distance of 40 inches outside of the smallest rectangle that encompasses the perimeter of the vehicle, as determined by the visibility test procedures in Appendix A. The proposed criteria are similar to criteria in the ISO 5006 standard, which are designed to enable an operator to see a person, who is at the 5th percentile for height, standing 1 meter from the vehicle; however, the proposed criteria are less complex, more stringent, and more protective. The results of the joint field study indicate that vehicle retrofits that do not pass the proposed criteria also do not pass the less stringent ISO 5006 criteria. Therefore, adopting the proposed criteria, rather than the ISO criteria, would provide greater worker protection without any additional negative impact on the ARB regulation.

To prevent retrofits from being installed in a manner that impairs visibility, the ARB and the Division released an interim visibility policy in October, 2009.[7] The interim policy states that off-road vehicles will be exempt from retrofit requirements if a retrofit cannot be installed without creating masking to the front, sides, or rear of the vehicle. The policy defines masking as the area where a vehicle operator's view would be blocked by the retrofit. Therefore, according to the interim policy, a retrofit creates masking even if it only slightly blocks the operator's view. According to the ARB, the interim policy exempts a large portion of the population of vehicles that the ARB thought could be retrofit. The ARB stated that it does not support adopting the interim visibility policy as a permanent standard to protect workers because it would result in a substantial loss in emission benefits associated with the diesel particulate regulation adopted in 2007.

The joint field study, like proposed Appendix A, measured masking 40 inches from the vehicle's perimeter at a height of 5 feet. If there was no masking observed around the perimeter of the vehicle at this height and distance, the joint field study reported that the retrofit vehicle did not create masking. Therefore, the joint field study masking criteria are less stringent than the interim policy masking criteria. Of the 50 vehicle types evaluated in the joint field study, approximately 70% would not create masking when retrofit, as determined by the procedures and criteria used in the field study. The ARB estimates that the vehicle types in the joint field study that could not be retrofit without creating masking, as measured in the study, represent a small loss of benefit associated with the regulation adopted in 2007. The ARB stated that it

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[6] Earth-moving machinery – Operator's field of view – Test method and performance criteria, ISO 5006:2006(E), International Organization for Standardization.
[7] Joint ARB and CalOSHA Interim Retrofit Visibility Policy, October 29, 2009. http://www.arb.ca.gov/msprog/ordiesel/documents/interim%20vis%20policy.pdf}

supports relying on the test procedures and criteria used in the joint field study to develop a standard that protects workers.[8]

Stakeholders and Board Members commented at the May, 2010, Board Meeting that proposed provisions regarding operator visibility should consider employees kneeling on the ground, such as grade-checkers, as well as standing workers. Grade-checkers are at risk of being stuck by construction equipment, as documented in an accident reported by the California Fatality Assessment and Control Evaluation (FACE) program.[9] In that accident, a grade-checker died when backed over by a motor grader with an operating back-up warning alarm.

Of the fifty vehicle evaluations conducted in the joint field study, the results of eighteen could potentially be affected if masking was measured at a height of 3.5 feet instead of 5 feet. These retrofits: 1) could not be installed under the hood, and 2) did not create masking when measured at a height of 5 feet. Seventeen of these vehicles were re-evaluated by measuring masking at a height of 3.5 feet. The results show that retrofits on two of the 17 vehicles, a backhoe loader and a crawler tractor, create some masking at a height of 3.5 feet, although the width of the masking would not necessarily prevent an operator from being able to see a person kneeling in this location.[10]

Even without retrofits, many large vehicles used around grade-checkers, such as graders, excavators, and loaders, have a high engine compartment behind the operator that creates masking that extends much further than 40 inches from the vehicle when measured at a height of 5 feet. The joint field study evaluated the masking created by these types of vehicles, without retrofits, and the results show masking extended 6 to 35 feet behind the vehicles when measured at a height of 5 feet. Because the vehicle itself creates masking that exceeds the proposed masking criteria for a retrofit vehicle, the proposal would not permit a retrofit to be installed on the engine hood where it would create additional masking.

NIOSH conducted a study that diagramed blind areas (masking) surrounding several types of construction vehicles without retrofits at elevations of 1500 millimeters (mm) or approximately 5 feet, 900 mm or approximately 3 feet, and ground level.[11] Figures 1 and 2, taken from the NIOSH study, illustrate that the areas that are: 1) near the rear engine compartment where a retrofit could be installed, 2) not masked at the 1500 mm elevation, 3) masked at the 900 mm elevation, and 4) begin within one meter (40 inches) of the vehicle, are confined to very small areas near the rear tires. These are the areas that would be affected by lowering the height at which masking is measured from 5 feet to 3.5 feet. It can be seen from the figures that these areas are relatively close to the vehicle and are a fraction of the total masked area behind the vehicle. This indicates that lowering the height at which masking is measured from 5 feet to 3.5

[8] Oral comments made by Eric White, Assistant Chief, Mobile Source Control Division, California Air Resources Board, at the May 20, 2010, Business Meeting of the Occupational Safety and Health Standards Board.
[9] California FACE Report #01CA008, National Institute for Occupational Safety and Health. http://www.cdc.gov/niosh/face/stateface/ca/01ca008.html
[10] Visibility Study: Evaluation of Masking at 3.5 Foot Height.
[11] Centers for Disease Control and Prevention: Highway Work Zone Safety, Construction Equipment Visibility, National Institute for Occupational Safety and Health.

feet would provide a relatively small increase in protection for workers in these masked areas. Squatting or kneeling close to large moving vehicles is inherently dangerous and should be avoided.

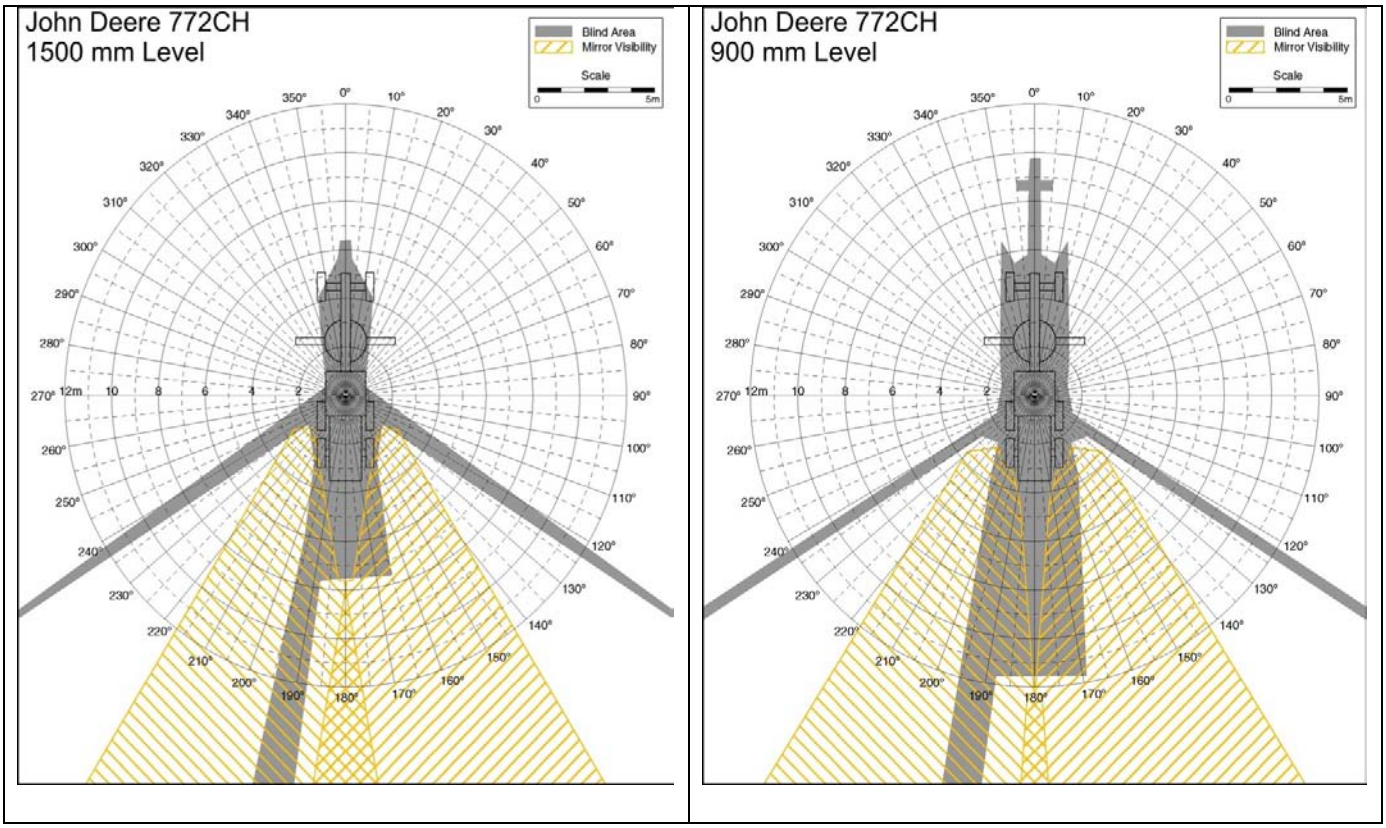

Figure 1 Figure 2

The proposed visibility test criteria in Appendix A, which measure masking 40 inches from the vehicle at a height of 5 feet, are necessary to allow vehicles to be retrofit to comply with ARB off-road diesel regulations, and to protect employees working near retrofit vehicles.

New Appendix A. Section A. General Requirements.

New Subsection A.1. Scope and Application.

New subsection A.1 would provide that where Sections 1591, 1597, 3663, 4925.1, or 7016 require retrofit vehicles be evaluated for visibility, the evaluation shall be in accordance with the procedures in Appendix A. The proposed provision is necessary to clarify the purpose and application of Appendix A.

New Subsection A.2. Definitions.

New subsection A.2 would provide a definition of "exhaust retrofit" and "masking". The definition of "exhaust retrofit" would be identical to the definition proposed to be added to

amended Section 1504. It is necessary to provide the definition in the Appendix for clarity so that it is immediately available when reading the appendix. The definition of "masking" is necessary for clarity because the term is used throughout Appendix A.

New Subsection A.3.

New subsection A.3 would provide that all line of sight measurements required by the visibility test shall consider the operator's direct view without the use of mirrors or cameras. This provision is necessary to clarify that the line of sight measurements required by subsections G and I shall be direct line of sight measurements without the use of cameras or mirrors. This provision is necessary because mirrors and cameras are not a safe, reliable substitute for an unobstructed view. The joint field study evaluated the use of OEM mirrors to reduce the masking created by exhaust retrofits. The results indicate that, for the vehicles evaluated in the study, the masking created by retrofits would not be reduced sufficiently by OEM mirrors to comply with the proposed masking criteria in Appendix A.

New Appendix A. Section B. Test Procedures and Performance Criteria.

New Subsection B.1.

New subsection B.1 would provide that all sections of an exhaust retrofit shall comply with at least one of the following conditions listed in subsections B.3.a through B.3.d: 1) are inside the OEM engine compartment, or 2) do not block the operator's view of the ground, or 3) do not create masking 5 feet above a line on the test surface that is a distance of 40 inches outside of the smallest rectangle that encompasses the perimeter of the vehicle, or 4) are retrofit exhaust stacks that create no more masking than the OEM exhaust stacks. This provision is necessary to limit the amount of masking that exhaust retrofits are allowed to create because workers in operator blind spots are at an increased risk of being struck by the retrofit vehicle. Each of the conditions listed in subsections B.3.a through B.3.d would reference the subsection that contains the visibility test procedures and criteria for determining compliance with the condition. This provision is necessary to provide objective test methods and criteria so that the results are accurate and repeatable. The subsection would also provide that any, or all, of the test procedures referenced in subsections B.3.a through B.3.d may be used to evaluate different sections of a single retrofit, except the procedures referenced in subsection B.3.d apply only to retrofit exhaust stacks. This provision is necessary to clarify the application of subsections B.3.a through B.3.d. Additional provisions would clarify which objects are considered part of an exhaust retrofit. These provisions are necessary to ensure all modifications made to the exhaust system or vehicle as part of the retrofit installation are evaluated for masking.

New Subsection B.2.

New subsection B.2 would provide that a retrofit passes the visibility test if all sections of the retrofit, except the exhaust stack, meet the performance criteria of at least one of the test procedures referenced in subsections B.3.a through B.3.c, and the retrofit exhaust stack meets the performance criteria of at least one of the test procedures referenced in subsections B.3.a through

B.3.d. This provision is necessary to define the conditions that must be met for an exhaust retrofit to pass the visibility test as required by Section 1591(m)(5).

New Subsection B.3.

New subsection B.3 would inform the reader that subsections B.3.a through B.3.d summarize conditions for passing the visibility test and reference test procedures and criteria for determining compliance with each of the conditions; and that subsections B.1 and B.2 specify how the conditions, procedures and criteria shall apply. This provision is necessary to provide procedures and criteria for passing the visibility test.

New Subsections B.3.a through B.3.d.

New subsections B.3.a through B.3.d would summarize conditions for passing the visibility test, and reference test procedures and criteria for determining compliance with each of the conditions. This provision is necessary to list alternative means and conditions for passing the visibility test and to refer the reader to the test procedures and criteria for determining compliance with each of the conditions. The provision is also necessary to assist the reader in selecting an appropriate test procedure for evaluating a particular retrofit section.

New Appendix A. Section C. Zero Masking Visibility Test Procedures.

New subsections C.1 and C.2 would provide test procedures that may be used to evaluate retrofit sections located, with respect to the operator's view, under, behind, or in front of parts of the vehicle. These test procedures are necessary to determine that the vehicle, and not the retrofit, blocks the operator's view towards the ground.

New Subsection C.1.

The procedures and criteria in new subsection C.1would apply when the conditions in subsection B.3.a must be met to comply with the provisions in Section B. New subsection C.1 would provide that the retrofit section shall be evaluated to determine if it is located inside the OEM engine compartment where it would not create masking. It would also provide that retrofit sections located inside the OEM engine compartment shall meet the test criteria for subsection C.1. These provisions are necessary to determine that the retrofit section does not block the operator's line of sight.

New Subsection C.2.

The procedures and criteria in new subsection C.2 would apply when the conditions in subsection B.3.b must be met to comply with the provisions in Section B. New subsection C.2 would provide procedures and criteria for determining that a retrofit section is behind or in front of parts of the vehicle with respect to the operator's view to the ground. Subsections C.2.a and C.2.b would provide that the vehicle and light source be positioned as instructed in Sections F and I, respectively. These provisions are necessary to produce accurate, repeatable results based

on the line of sight of the average height and weight operator. Subsections C.2.c and C.2.d would provide that the person conducting the visibility test establish a line of sight view towards the light source that represents, in reverse, the operator's line of sight view towards the ground behind the retrofit section. These provisions are necessary to determine that the retrofit section does not block the operator's line of sight.

New Appendix A. Section D. Rectangular Boundary Visibility Test Procedures.

The procedures and criteria in new Section D would apply when the conditions in subsection B.3.c must be met to comply with the provisions in Section B. New Section D would provide test procedures and criteria for determining that a retrofit section does not create masking 5 feet above a line on the test surface that is a distance of 40 inches outside of the smallest rectangle that encompasses the perimeter of the vehicle. Subsection D.1 and D.2 would provide that the vehicle and light source be positioned as instructed in Sections F and I, respectively. These provisions are necessary to produce accurate, repeatable results based on the line of sight of the average height and weight operator. Subsections C.3 through C.5 would provide that a 5 foot high railing be positioned directly above a line that is 40 inches outside of the smallest rectangle that encompasses the perimeter of the vehicle. These provisions are necessary to establish a reference point for measuring masking. Subsection D.6 and D.7 would provide that the person conducting the visibility test establish a line of sight view towards the light source that represents, in reverse, the operator's line of sight view towards the 5 foot high railing positioned 40 inches from the vehicle. This provision is necessary to determine that the retrofit section does not create masking 5 feet above a line on the test surface that is a distance of 40 inches outside of the smallest rectangle that encompasses the perimeter of the vehicle. Subsection D.8 would provide three conditions that must be met to satisfy the rectangular boundary visibility test. Subsection D.8.a would provide that the retrofit section does not block the view of both lights; subsection D.8.b would provide that the retrofit section is not visible above the 5 foot railing; and subsection D.8.c would provide that the retrofit section is not above a part of the vehicle blocking the view of both lights. These provisions are necessary to establish that the retrofit section does not create masking at an elevation of 5 feet at a distance greater than 40 inches from the vehicle.

New Appendix A. Section E. Exhaust Stack Visibility Test Procedures.

The procedures and criteria in new Section E would apply when the conditions in subsection B.3.d must be met to comply with the provisions in Section B. New Section E would provide test procedures and criteria for determining that a vertical retrofit exhaust stack, due to its size and location, creates no more masking than the OEM exhaust stack. Subsection E.1 provides that the diameter of the OEM and retrofit exhaust stacks be determined. Subsection E.2 provides that the location of the OEM and retrofit exhaust stacks be determined in relation to the operator's position. These provisions are necessary to determine the relative size and position of the areas masked by the OEM and retrofit exhaust stacks. Subsection E.3 would provide three conditions that must be met to satisfy the exhaust stack visibility test. These provisions are necessary to determine that the area masked by the retrofit stack is in the same general location as the area masked by the OEM stack, and it is smaller than the area masked by the OEM stack.

New Appendix A. Section F. Vehicle Position.

The procedures in new Section F would apply when the conditions in subsections B.3.b or B.3.c must be met to comply with the provisions in Section B. New Section F would provide procedures for positioning of the vehicle for testing. Subsection F.1 would require that the vehicle is parked on an area of compacted earth or paved surface with a gradient of no more than 3% in any direction. This provision is necessary to ensure that the results of the procedures in subsection C.2 and Section D are accurate and reproducible, because an uneven or sloped test surface can affect the test results. Subsection F.2 would provide that the vehicle attachments be safely positioned in the traveling position. This provision is necessary for the safety of persons performing the tests and to ensure that the results of the procedures in subsection C.2 and Section D are accurate and reproducible, because the position of vehicle attachments can affect the test results.

New Appendix A. Section G. Seat Reference Point.

The procedures in new Section G would apply when the conditions in subsections B.3.b or B.3.c must be met to comply with the provisions in Section B. New Section G would provide procedures for positioning the operator seat in the middle of its adjustable range and for locating a seat reference point. Subsections G.1 through G.4 would provide that the operator seat be positioned in the middle of its adjustable range. This provision is necessary to establish a seat position that is reasonable for the average size operator and is reproducible. Subsections G.5 through G.6 would provide procedures for locating the seat reference point. The seat reference point is necessary to locate a point that is used to establish the operator's eye position, which is used to perform line of sight measurements to identify masking.

New Appendix A. Section H. Light Filament Height.

The procedures in new subsections H.1 through H.5 would apply when the conditions in subsections B.3.b or B.3.c must be met to comply with the provisions in Section B. New Section H would provide procedures for determining the light filament height. The light filament height establishes the vertical distance above the seat reference point that represents the eye level of the average height and weight operator when sitting. New Section H would establish a light filament height of 30½ inches for seats that do not sink in elevation (compress) when sat on. Subsections H.1 through H.5 would provide procedures for calculating the light filament height for seats that compress when sat on. These procedures are necessary to facilitate accurate, reliable, and reproducible test results by determining the distance above the seat reference point that represents the operator's eye level.

Appendix A. Section I. Light Source Position.

The procedures in new subsections I.1 through I.5 apply when the conditions in subsections B.3.b or B.3.c must be met to comply with the provisions in Section B. New Section I would provide procedures for constructing and positioning a light source. The light source position

represents the position of the average operator's eyes when operating the vehicle. Subsection I.1 provides for constructing a light with two lights space 8 inches apart and 4 inches from the center. The light spacing simulates the average operator's ability to move his or her head and torso which increases the horizontal range of eye positions. Subsection I.2 provides that the center of the lights shall be easily identified in day light at a distance of 40 feet. Subsections I.3.a and I.3.b provide that the light bar support allows the light bar to be rotated 360 degrees on a horizontal plane with the axis of rotation center between the two lights, and the lights be ½ to 2 inches in front of the axis of rotation of the light bar. The position of the lights simulates the average operator's eye position. Subsections I.4 through I.6 provide for positioning the light bar on the operator seat such that the horizontal axis of rotation is directly above the seat reference point, the center of the lights are at a height equal to the light filament height calculated in Section H.5, and the lights point directly towards the retrofit. These provisions are necessary to facilitate accurate, reliable, and reproducible test results.

Section 1597. Jobsite Vehicles.

Existing Section 1597 pertains to the construction and operation of jobsite vehicles.

New Subsection (l). Exhaust retrofits.

New Section 1597(l) would provide that exhaust retrofits on jobsite vehicles comply with Section 1591(m). A jobsite vehicle is defined in Section 1504 as a vehicle which is operated on a jobsite exclusively and is excluded from the provisions of applicable traffic and vehicular codes, and haulage and earthmoving vehicles regulated by the provisions of Article 10 of these Orders. The proposed amendment is necessary because some jobsite vehicles are regulated under the ARB off-road diesel rule, it is expected that employers will retrofit job-site vehicles to comply with the ARB rule, and the potential hazards related to exhaust retrofits on jobsite vehicles are the same as the hazards addressed in proposed Section 1591(m).

Section 3663. Maintenance of Industrial Trucks.

Subsection (g).

Existing Section 3663(g) provides that industrial trucks shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer, nor shall they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts, except as provided in subsection (h) of this Section. This provision prevents industrial truck accidents that result from an industrial truck becoming imbalanced due to the alteration of its parts. The proposal would amend subsection (g) so that industrial trucks that are altered in accordance with the provisions of proposed new subsection (i) would also be exempt from the general prohibition on altering truck parts. New subsection (i) would provide that exhaust retrofits comply with Section 1591(m). The proposed amendment to Section 3663(g) is necessary to allow exhaust retrofits that comply with proposed Section 1591(m). New Section 1591(m)(1) would provide that an exhaust retrofit shall not reduce the capacity, structural integrity, or safe performance of a vehicle; therefore, this

provision would prohibit exhaust retrofits that alter the truck in a manner that reduces the designed balance or operational stability of the industrial truck [thus, retrofits are allowed only if safety is not impaired, which conforms with the intent of existing Section 3663(g)].

New Subsection (i).

New Section 3663(i) would provide that exhaust retrofits on industrial trucks comply with Section 1591(m). The proposed amendment is necessary because forklifts and other industrial trucks are regulated under the ARB off-road diesel rule, it is expected that employers will retrofit industrial trucks to comply with the ARB rule, and the potential hazards related to exhaust retrofits on jobsite vehicles are the same as the hazards addressed in proposed Section 1591(m).

New Section 4925.1. Exhaust Retrofits.

New Section 4925.1 would be located in Article 93, which pertains to boom-type mobile cranes. New Section 4925.1 would provide that exhaust retrofits on boom-type mobile cranes comply with Section 1591(m). The proposed amendment is necessary because some boom-type mobile cranes are regulated under the ARB off-road diesel rule, it is expected that employers will retrofit boom-type mobile cranes to comply with the ARB rule, and the potential hazards related to exhaust retrofits on boom-type mobile cranes are the same as the hazards addressed in proposed Section 1591(m).

Section 7016. Haulage Vehicle, Construction and Maintenance.

Existing Section 7016 pertains to the construction and maintenance of haulage vehicles use in mining operations.

New Subsection (m). Exhaust retrofits.

New subsection (m) would provide that exhaust retrofits on these types of vehicles comply with Section 1591(m). The proposed amendment is necessary because some haulage vehicles covered by Section 7016(m) are regulated under the ARB off-road diesel rule, it is expected that employers will retrofit these vehicle to comply with the ARB rule, and the potential hazards related to exhaust retrofits on haulage vehicles used in mining operations are the same as the hazards addressed in proposed Section 1591(m).

DOCUMENTS RELIED UPON

1. Estimate of Premature Deaths Associated with Fine Particle Pollution (PM2.5) in California Using a U.S. Environmental Protection Agency Methodology, California Air Resources Control Board, August 31, 2010.
2. Preliminary Results of Joint ARB/DOSH/OSHSB Field Study of Retrofit Feasibility for Most Common Vehicles, California Air Resources Board Staff Report, May 10, 2010.
3. De Rosa, M.I. (2004). Analysis of Mine Fires for All U.S. Metal/Nonmetal Mining Categories, 1990-2001. NIOSH IC 9476.

4. Standard Guide for Heated System Surface Conditions that Produce Contact Burn Injuries, ASTM C 1055 – 03, ASTM International.
5. DOSH Inspections with Crane Standards Cited: 1590, 1591, 1592, 1593, 3663, and 3706, Report generated by Bob Hayes, DOSH Budget and Program Offices, transmitted to OSHSB on November 19, 2008.
6. Earth-moving machinery – Operator's field of view – Test method and performance criteria, ISO 5006:2006(E), International Organization for Standardization.
7. Joint ARB and CalOSHA Interim Retrofit Visibility Policy, October 29, 2009. http://www.arb.ca.gov/msprog/ordiesel/documents/interim%20vis%20policy.pdf
8. Oral comments made by Mr. Eric White, Assistant Chief, Mobile Source Control Division, California Air Resources Board, at the May 20, 2010, Business Meeting of the Occupational Safety and Health Standards Board.
9. California FACE Report #01CA008, National Institute for Occupational Safety and Health. http://www.cdc.gov/niosh/face/stateface/ca/01ca008.html
10. Visibility Study: Evaluation of Masking at 3.5 Foot Height.
11. Centers for Disease Control and Prevention: Highway Work Zone Safety, Construction Equipment Visibility, National Institute for Occupational Safety and Health. http://www.cdc.gov/niosh/topics/highwayworkzones/BAD/default.html
12. Petition letter (Petition 507) from Associate General Contractors of California and the Operating Engineers, Local 3, dated August 7, 2008.
13. Division of Occupational Safety and Health's Evaluation of Petition 507, dated September 8, 2008.
14. Occupational Safety and Health Standards Board's Petition 507 Decision, dated November 20, 2008.
15. Cost Analysis for Vehicle Exhaust Retrofits, Attachment No. 2 of Economic and Fiscal Impact Statement for Occupational Safety and Health Standards Board's rulemaking proposal.

These documents are available for review Monday through Friday from 8:00 a.m. to 4:30 p.m. at the Standards Board Office located at 2520 Venture Oaks Way, Suite 350, Sacramento, California.

REASONABLE ALTERNATIVES THAT WOULD LESSEN ADVERSE ECONOMIC IMPACT ON SMALL BUSINESSES

No reasonable alternatives were identified by the Board and no reasonable alternatives identified by the Board or otherwise brought to its attention would lessen the impact on small businesses.

SPECIFIC TECHNOLOGY OR EQUIPMENT

This proposal will not mandate the use of specific technologies and equipment.

COST ESTIMATES OF PROPOSED ACTION

Costs or Savings to State Agencies

The proposal would affect a limited number of State Agencies, including: Department of Transportation, Department of Fish and Game, Department of Water Resources, and Department of General Services. State government fleets represent 1.6% of the total horsepower in all fleets. Assuming the cost impact on State government is 1.6% of the total maximum cost impact of $ 46 million, the cost impact on State government is less than $ 700,000.

A Division of Occupational Safety and Health review of workplace accidents shows that employees working near off-road vehicles are at risk of being struck by a vehicle and killed or seriously injured where the vehicle operator's view of the employee is blocked by part of the vehicle.[5] This proposal would reduce employee fatalities and injuries by prohibiting retrofits that block the operator's view of areas surrounding a vehicle. The total cost of one fatality would outweigh the cost for a State agency to comply with the proposal.

The total maximum cost impact of $46 million is based on the following:

Estimated number of vehicles impacted by the OSHSB proposal:

- Number of vehicles subject to ARB rule: 150,000 - based on required reports to ARB
- Number of vehicles impacted by ARB rule: 20,400.
    - Assumes that 46% of fleets will not meet fleet average emission requirements and will be impacted (required to retrofit or replace vehicles) - based on ARB data that 46% of fleets have an average vehicle age > 10 to 12 years old.
    - Assumes that after 2019 no vehicles will be retrofit because it will be more cost effective to replace a vehicle with a used lower-emission vehicle.
    - The large fleets required to take action will need to retrofit or replace 49% of their vehicles by 2020 or 16,000 vehicles, based on an initial compliance date of 2014 and annual requirements in years 2015 to 2020.
    - The medium fleets required to take action will need to retrofit or replace 28% of their vehicles by 2020 or 2,000 vehicles, based on an initial compliance date of 2017 and annual requirements in years 2018 and 2019.
    - The small fleets required to take action will need to retrofit or replace 10% of their vehicles or 2,400 vehicles, based on an initial compliance date of 2019.
- Number of impacted vehicles that fall in the Hp and age range normally retrofit : 13,300
    - Based on retrofits already reported to ARB, 95% of retrofit vehicles fall within 55 to 500 Hp and 95% are newer than 1992 model engines.
    - Based on data reported to ARB, 78% of all vehicles fall within 50 to 500 Hp and 78% have newer than 1992 engine models.

[5] DOSH Inspections with Crane Standards Cited: 1590, 1591, 1592, 1593, 3663, and 3706, Report generated by Bob Hayes, DOSH Budget and Program Offices, transmitted to OSHSB on November 19, 2008.

- Number of impacted vehicles in the Hp and age range normally retrofit that would be cost effective to retrofit: 9,300
    - Assumes average cost of a retrofit is $125/Hp based on Initial Statement of Reasons (ISOR) for proposed amendments to the ARB off-road diesel regulation noticed October 2010.
    - Assumes 18 year old vehicle would be replaced with a 10 year old vehicle.
    - Cost of replacing a vehicle type in $/Hp is based on replacement costs and cost curves found in the ISOR for the ARB proposed amendments noticed October, 2010 and available at http://www.arb.ca.gov/msprog/ordiesel/offroad_1085.htm
    - Assumes that vehicle types costing more than $125/Hp to replace are cost effective to retrofit.
    - Based on the distribution of vehicles by vehicle type as reported to ARB, 30% of impacted vehicles in the Hp and age range normally retrofit would be cost effective to retrofit.
- Number of impacted vehicles in the Hp and age range normally retrofit that would be cost effective to retrofit and can be retrofit in accordance with the OSHSB proposal: 6,200.
    - Based on the joint field study that showed approximately 67% of the most common types of vehicles can be retrofit in compliance with the proposed visibility standard. [2]
- Number of impacted vehicles in the Hp and age range normally retrofit that would be cost effective to retrofit but will instead be replaced because no retrofit is available that complies with the OSHSB proposal: 3,100
    - Based on joint field study.[2]

Estimated cost impact of the OSHSB proposal:

- Cost of performing a visibility test, documenting, and creating records: $4.65 million
    - Assumes 9,300 vehicles will be tested at an average cost of $500 per vehicle.
    - Assumes maintaining test records will not result in additional costs because vehicle retrofit records are already required by ARB.
- Cost of modifying retrofit installations to comply with OSHSB proposal: $16.7 million
    - Assumes an average cost increase of 14% per retrofit based on two retrofit manufacturers' estimates for retrofitting 23 of the 50 vehicles in the joint visibility study.
    - Based on an average retrofit cost of $125 per Hp, an average of 158 Hp per vehicle as reported to ARB, and 6,200 vehicles expected to be retrofit.
- Cost of replacing vehicles in the Hp and age range normally retrofit that would be cost effective to retrofit but will instead be replaced because no retrofit is available that complies with the OSHSB proposal: $25.0 million. This cost was calculated as follows:
    - Determined all vehicles types with "cost per Hp of replacement" > 125 $/Hp

[2] Preliminary Results of Joint ARB/DOSH/OSHSB Field Study of Retrofit Feasibility for Most Common Vehicles, California Air Resources Board Staff Report, May 10, 2010.

- For each vehicle type, calculated "cost per Hp of replacement over retrofit" by subtracting $125/Hp from "cost per Hp of replacement".
- For each vehicle type, calculated "cost per vehicle of replacement over retrofit" by multiplying "cost per Hp of replacement over retrofit" by 158 Hp per vehicle.
- For each vehicle type determined "per cent of all vehicles in State" from reports to ARB.
- For each vehicle type, determined "relative weight" of each vehicle type by calculating the per cent of all vehicles types with "cost per Hp of replacement" > 125 $/Hp.
- For each vehicle type, calculated the portion of the "average cost per vehicle of replacement over retrofit" by multiplying the "cost per vehicle of replacement over retrofit" by the "relative weight".
- Calculated the "average cost per vehicle of replacement over retrofit" by summing the portion of the "average cost per vehicle of replacement over retrofit" for each vehicle type.
- Calculated the "total cost of replacing over retrofit" by multiplying the "average cost per vehicle of replacement over retrofit" ($8,052) by 3,100 vehicles.

Impact on Housing Costs

The Board has made an initial determination that this proposal will not significantly affect housing costs.

Impact on Businesses

The Board has made a determination that this proposal will not result in a significant, statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states. In making this determination, the Board relied on the following studies and relevant data:

1. Preliminary Results of Joint ARB/DOSH/OSHSB Field Study of Retrofit Feasibility for Most Common Vehicles, California Air Resources Board Staff Report, May 10, 2010.
2. Cost Analysis for Vehicle Exhaust Retrofits, Attachment No. 2 of Economic and Fiscal Impact Statement for OSHSB rulemaking proposal noticed December, 2010.

Cost Impact on Private Persons or Businesses

The Board is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

Costs or Savings in Federal Funding to the State

The proposal will not result in costs or savings in federal funding to the state.

Costs or Savings to Local Agencies or School Districts Required to be Reimbursed

No costs to local agencies or school districts are required to be reimbursed. See explanation under "Determination of Mandate."

Other Nondiscretionary Costs or Savings Imposed on Local Agencies

This proposal does impose nondiscretionary costs or savings on local agencies. The proposal would affect a limited number of State Agencies, including: Local governments including cities, counties, municipalities and special districts would be affected to the extent that they own off-road diesel vehicles impacted by the ARB regulation. Local government fleets represent 6.1% of the total horsepower in all fleets. Assuming the cost impact on local government is 6.1% of the total cost impact of $ 46 million, the cost impact on local government is approximately $ 2.8 million.

DETERMINATION OF MANDATE

The Occupational Safety and Health Standards Board has determined that the proposed standards do not impose a local mandate. Therefore, reimbursement by the state is not required pursuant to Part 7 (commencing with Section 17500) of Division 4 of the Government Code because the proposed amendments will not require local agencies or school districts to incur additional costs in complying with the proposal. Furthermore, these standards do not constitute a "new program or higher level of service of an existing program within the meaning of Section 6 of Article XIII B of the California Constitution."

The California Supreme Court has established that a "program" within the meaning of Section 6 of Article XIII B of the California Constitution is one which carries out the governmental function of providing services to the public, or which, to implement a state policy, imposes unique requirements on local governments and does not apply generally to all residents and entities in the state. (County of Los Angeles v. State of California (1987) 43 Cal.3d 46.)

These proposed standards do not require local agencies to carry out the governmental function of providing services to the public. Rather, the standards require local agencies to take certain steps to ensure the safety and health of their own employees only. Moreover, these proposed standards do not in any way require local agencies to administer the California Occupational Safety and Health program. (See City of Anaheim v. State of California (1987) 189 Cal.App.3d 1478.)

These proposed standards do not impose unique requirements on local governments. All employers - state, local and private - will be required to comply with the prescribed standards.

EFFECT ON SMALL BUSINESSES

The Board has determined that the proposed amendments may affect small businesses. However, no economic impact is anticipated.

ASSESSMENT

The adoption of the proposed amendments to these standards will neither create nor eliminate jobs in the State of California nor result in the elimination of existing businesses or create or expand businesses in the State of California.

ALTERNATIVES THAT WOULD AFFECT PRIVATE PERSONS

No reasonable alternatives have been identified by the Board or have otherwise been identified and brought to its attention that would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.